

Berkeley Lab FY '05 50 OSHA Recordable Cases Root Causes & Lessons

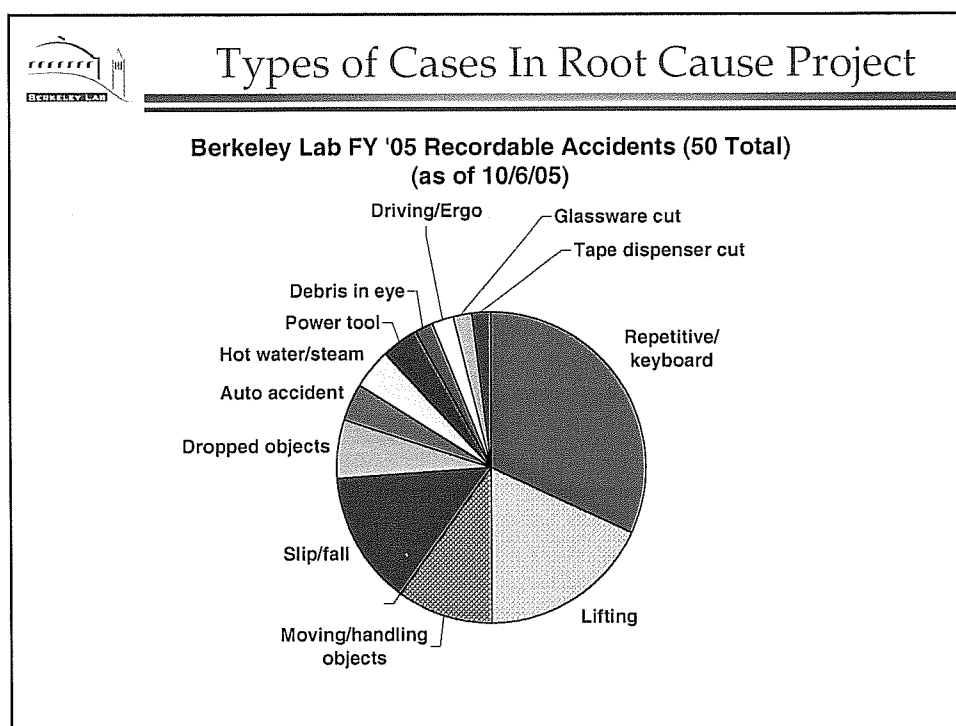
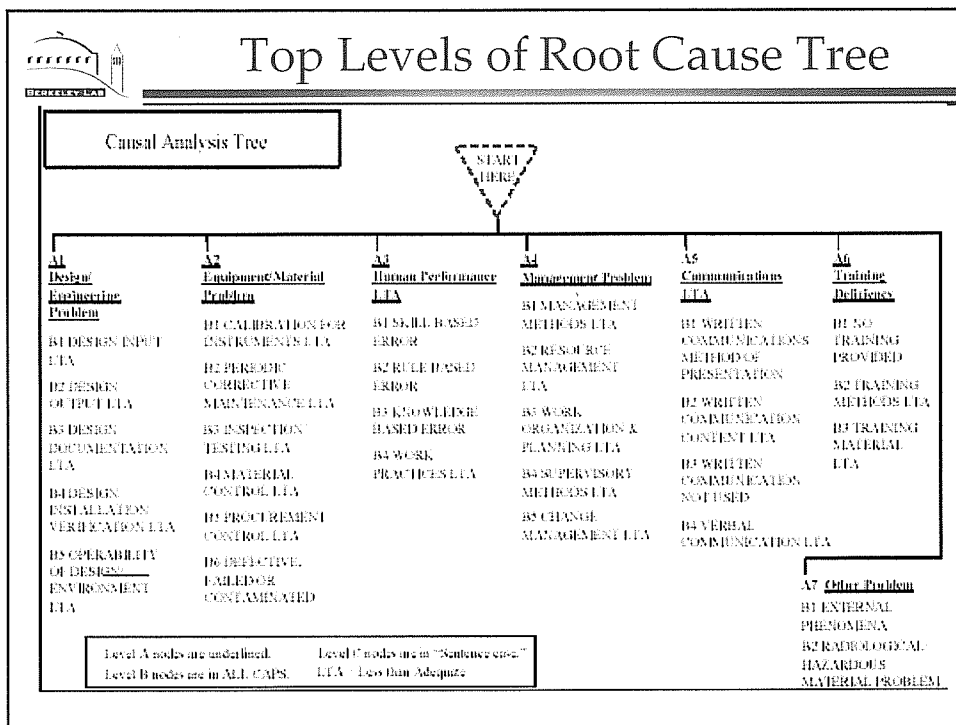
Matt Kotowski & Mike Ruggieri
January 9, 2006

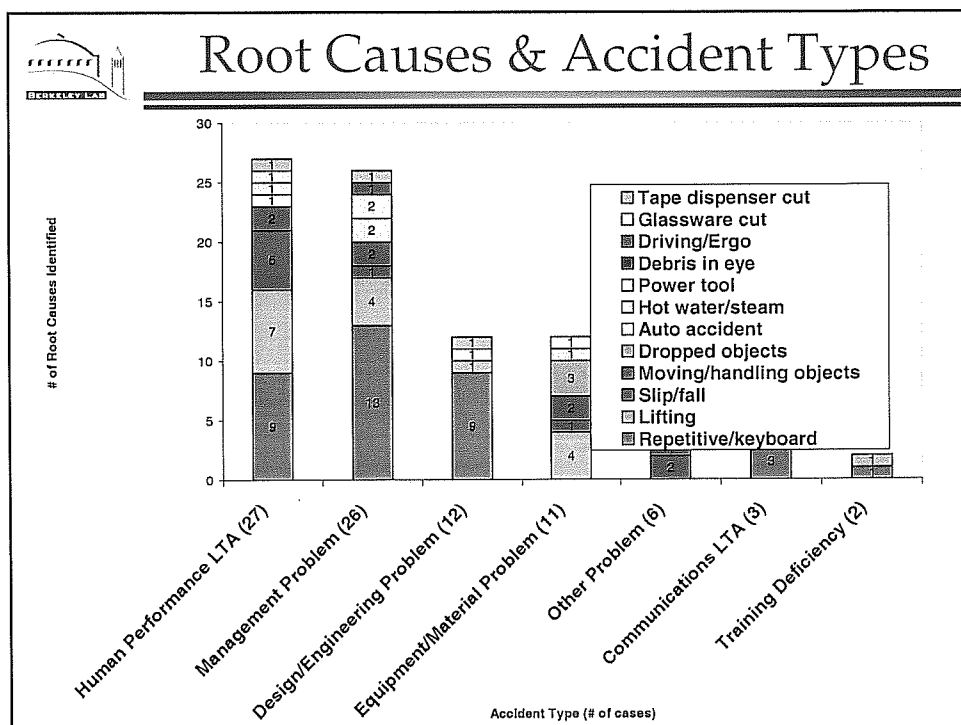
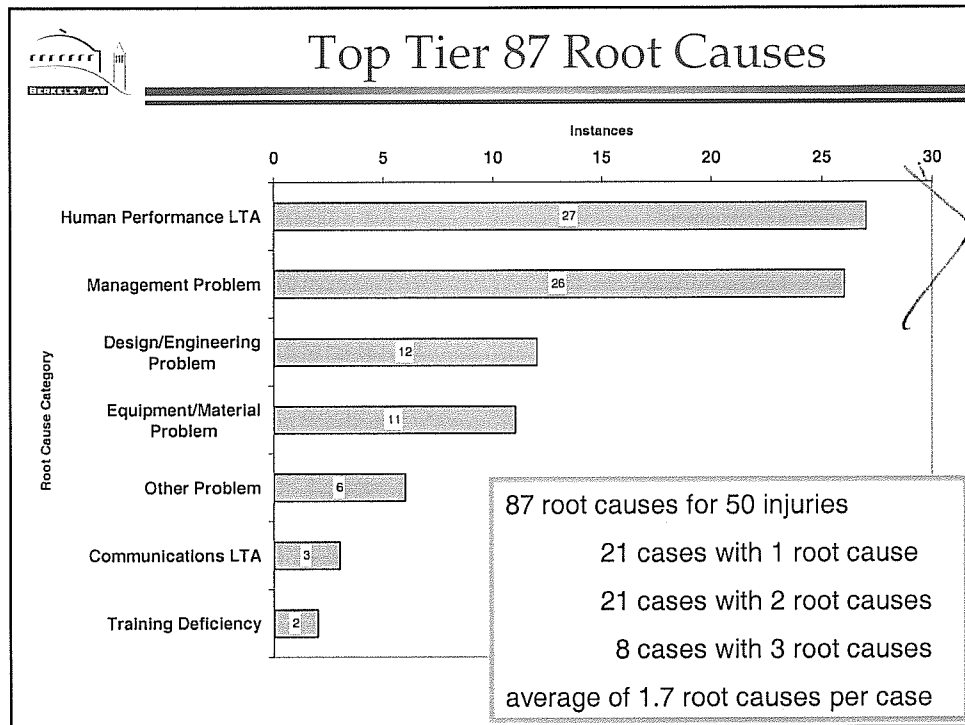


Background

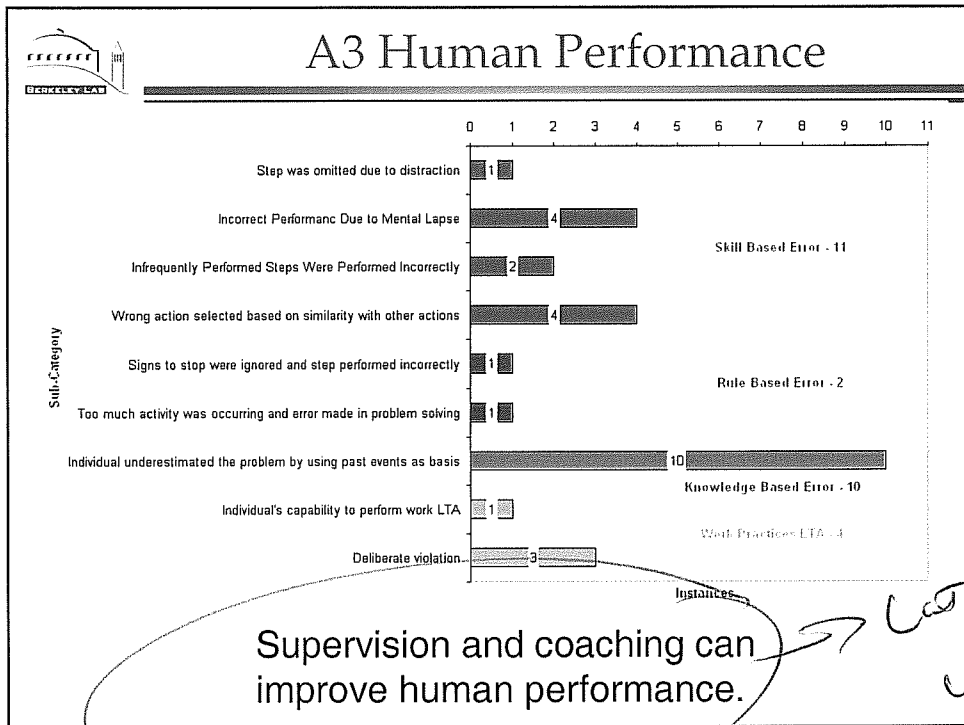
- **Better information for accident prevention is needed**
- **A Task Force was formed to perform a root cause analysis for all FY '05 OSHA Recordable Injuries**
- **Task Force members were**
 - » Richard DeBusk, Safety Manager; Carol Fried, Head, EH&S Division Liaisons; Matt Kotowski, Safety Group; Mike Ruggieri, Safety Group; Weyland Wong, Chair, ES&H Coordinators
- **Methodology:**
 - » Individual cases were reviewed with the respective EH&S Division Liaison when available, and
 - » 1 – 3 root causes were assigned by consensus, utilizing the DOE Occurrence Reporting Root Cause Table

Note: Because the analysis was done in retrospect, with limited ability to verify facts, others might have come to different conclusions in individual cases than the Task Force. But we believe that this is a valid representation of the overall situation.

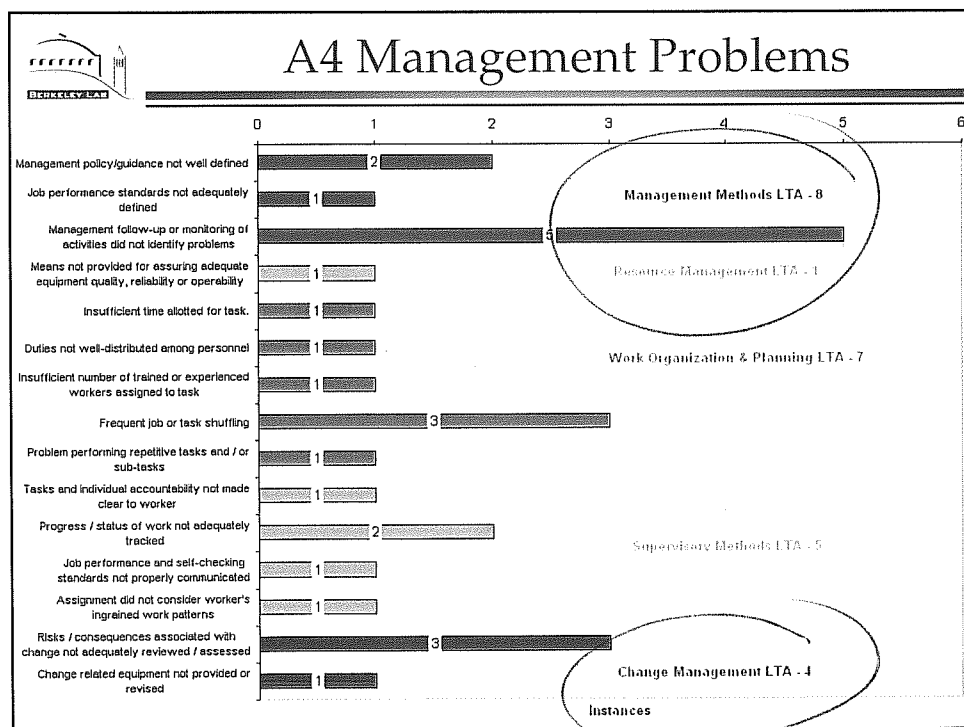


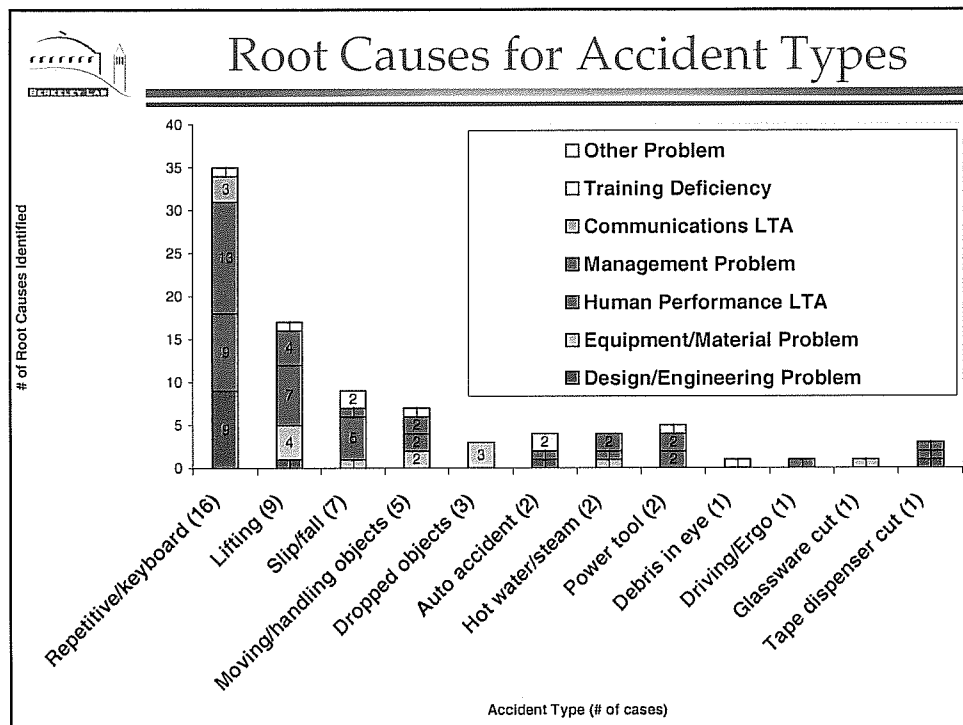


Br @ B level




Let's make a list of weaknesses




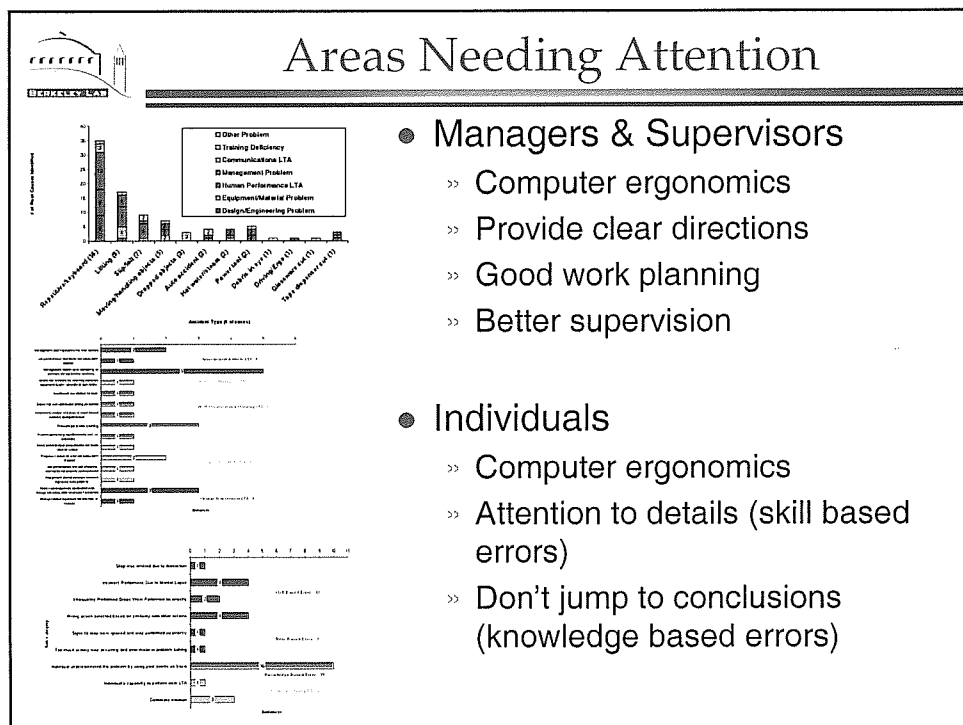


Repetitive Keyboard Root Causes

A1	Design / Engineering Problem	9
A1B5C01	Operability of Design/Environment LTA - Ergonomics LTA	9
A3	Human Performance LTA	9
A3B1C06	Skill Based Error - Wrong action selected based on similarity with other actions	1
A3B2C02	Rule Based Error - Signs to stop were ignored and step performed incorrectly	1
A3B3C06	Knowledge Based Error - Individual underestimated the problem by using past events as basis	6
A3B4C01	Work Practices LTA - Individual's capability to perform work LTA	1
A4	Management Problem	13
A4B1C02	Management Methods LTA - Job performance standards not adequately defined	1
A4B1C04	Management Methods LTA - Management follow-up or monitoring of activities did not identify problems	2
A4B2C08	Resource Management LTA - Means not provided for assuring adequate equipment quality, reliability or operability	1
A4B3C02	Work Organization & Planning LTA - Insufficient time allotted for task.	1
A4B3C03	Work Organization & Planning LTA - Duties not well-distributed among personnel	1
A4B3C08	Work Organization & Planning LTA - Frequent job or task shuffling	2
A4B4C02	Supervisory Methods LTA - Progress / status of work not adequately tracked	1
A4B5C04	Change Management LTA - Risks / consequences associated with change not adequately reviewed / assessed	3
A4B5C10	Change Management LTA - Change related equipment not provided or revised	1
A5	Communications LTA	3
A5B4C06	Verbal Communications LTA - Suspected problems not communicated to supervision	3
A6	Training Deficiency	1
A6B2C03	Training Methods LTA - Refresher training LTA	1

 <h2>Lifting Root Causes</h2>		
A1	Design / Engineering Problem	1
A1B1C03	Design/Engineering Problem - Design input not correct	1
A2	Equipment / Material Problem	3
A2B4C01	Material Control LTA - Material Handling LTA	3
A3	Human Performance LTA	7
A3B1C03	Skill Based Error - Incorrect Performanc Due to Mental Lapse	1
A3B1C04	Skill Based Error - Infrequently Performed Steps Were Performed Incorrectly	1
A3B1C06	Skill Based Error - Wrong action selected based on similarity with other actions	1
A3B2C03	Rule Based Error - Too much activity was occurring and error made in problem solving	1
A3B3C06	Knowledge Based Error - Individual underestimated the problem by using past events as basis	2
A3B4C02	Work Practices LTA - Deliberate violation	1
A4	Management Problem	4
A4B1C04	Management follow-up or monitoring of activities did not identify problems	1
A4B2C08	Resource Management LTA - Means not provided for assuring adequate equipment quality, reliability or operability	1
A4B4C02	Supervisory Methods LTA - Progress / status of work not adequately tracked	1
A4B4C06	Supervisory Methods LTA - Job performance and self-checking standards not properly	1
A6	Training Deficiency	1
A6B2C01	Training Methods LTA - Practice or hands-on experience LTA	1

 <h2>Slip / Fall Root Causes</h2>		
A2	Equipment / Material Problem	1
A2B3C02	Inspection/Testing LTA - Inspection/Testing LTA	1
A3	Human Performance LTA	5
A3B1C03	Skill Based Error - Incorrect Performanc Due to Mental Lapse	2
A3B1C06	Skill Based Error - Wrong action selected based on similarity with other actions	1
A3B3C06	Knowledge Based Error - Individual underestimated the problem by using past events as basis	1
A3B4C02	Work Practices LTA - Deliberate violation	1
A4	Management Problem	1
A4B1C01	Management Methods LTA - Management policy/guidance not well defined	1
A7	Other Problem	2
A7 Indet.	Indeterminable	1
A7 NP	Not Preventable	1

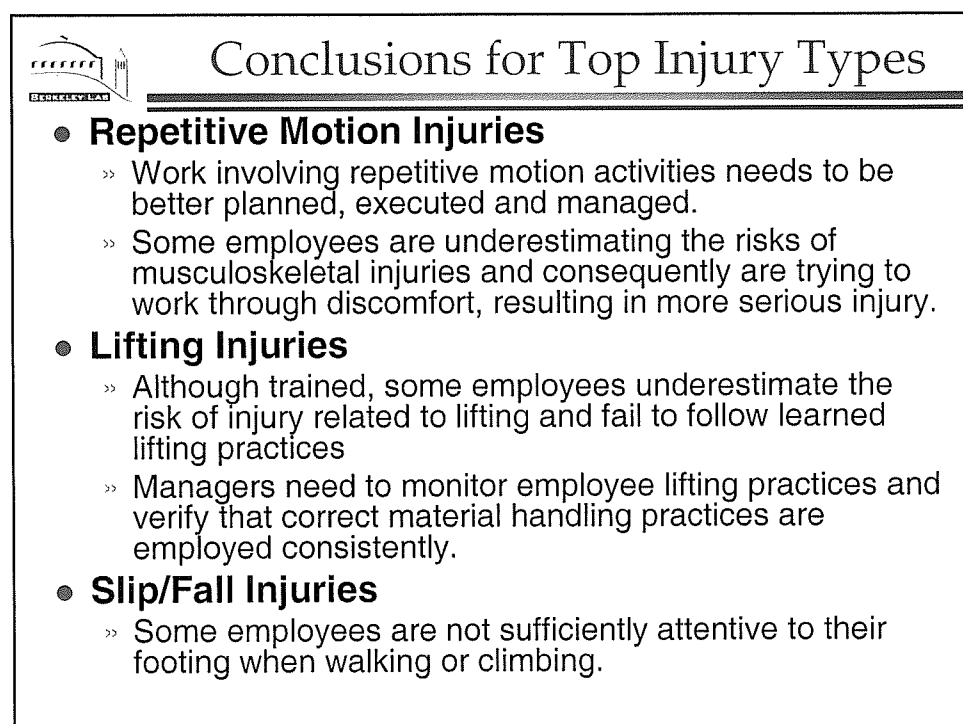


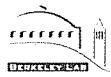
● Managers & Supervisors

- » Computer ergonomics
- » Provide clear directions
- » Good work planning
- » Better supervision

● Individuals

- » Computer ergonomics
- » Attention to details (skill based errors)
- » Don't jump to conclusions (knowledge based errors)






System Lessons

- Supervisor and Investigator reports do not formally identify root causes.
- Corrective actions identified usually address the most proximate cause, not root causes.
- Training deficiencies are not a significant problem at LBNL

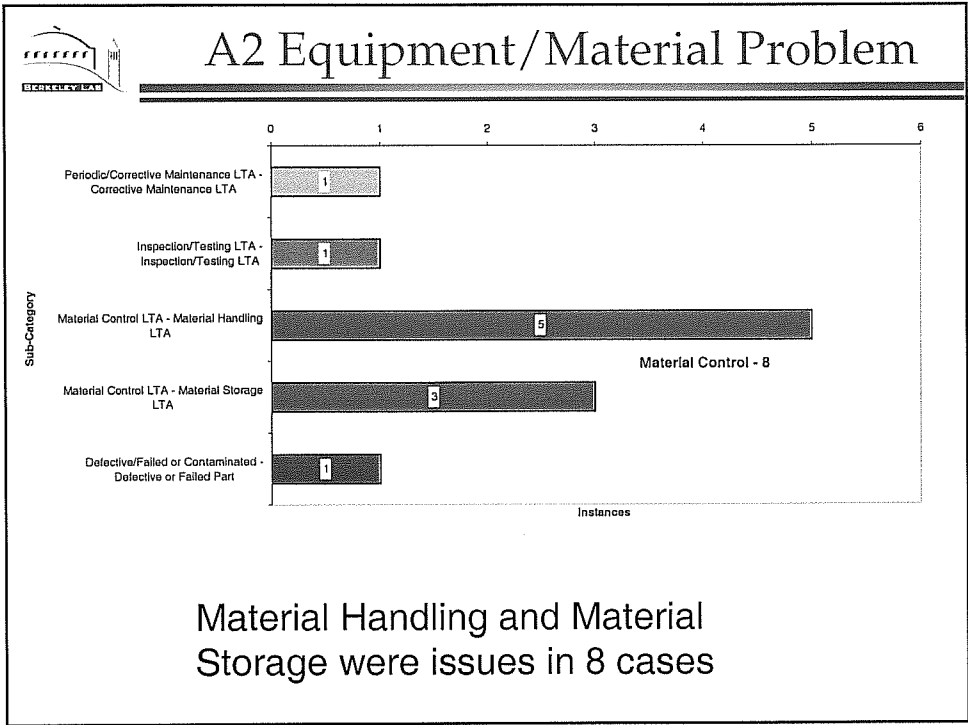


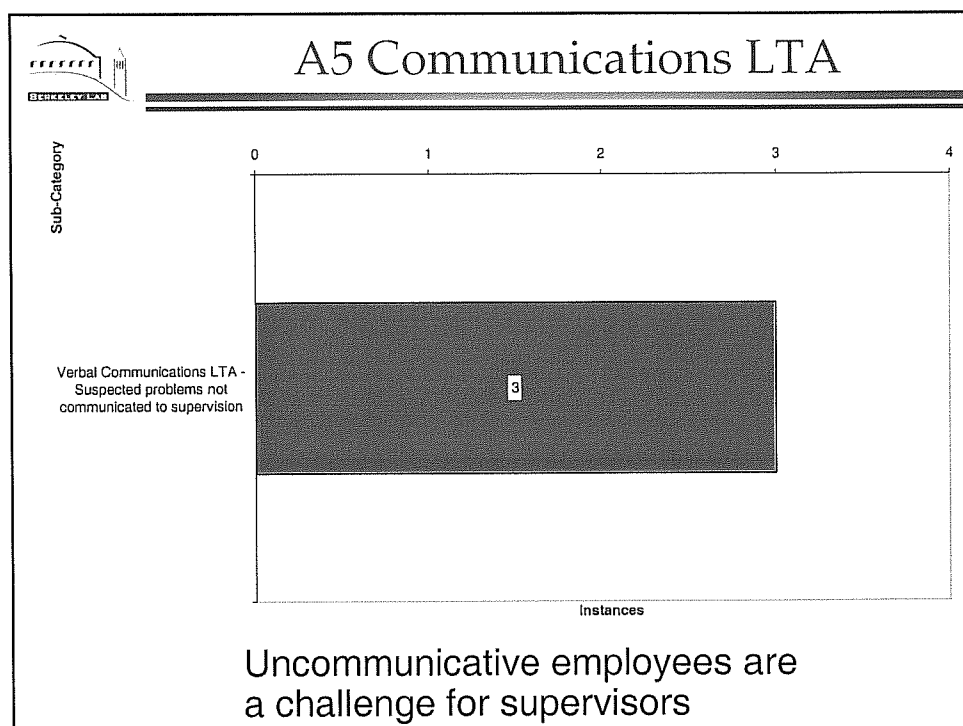
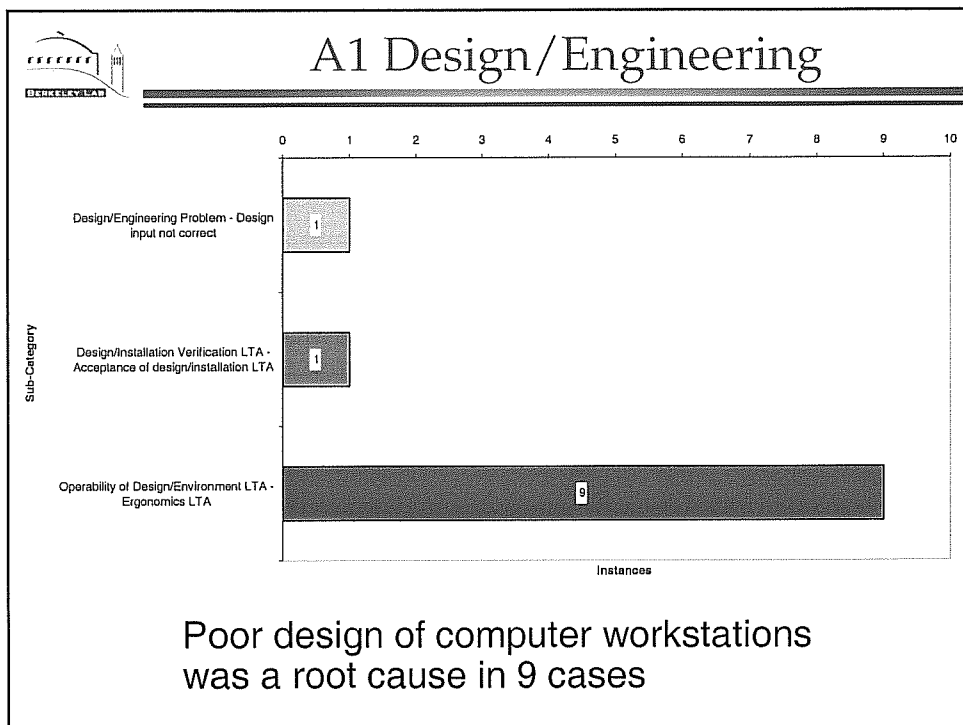
Path Forward For System Lessons

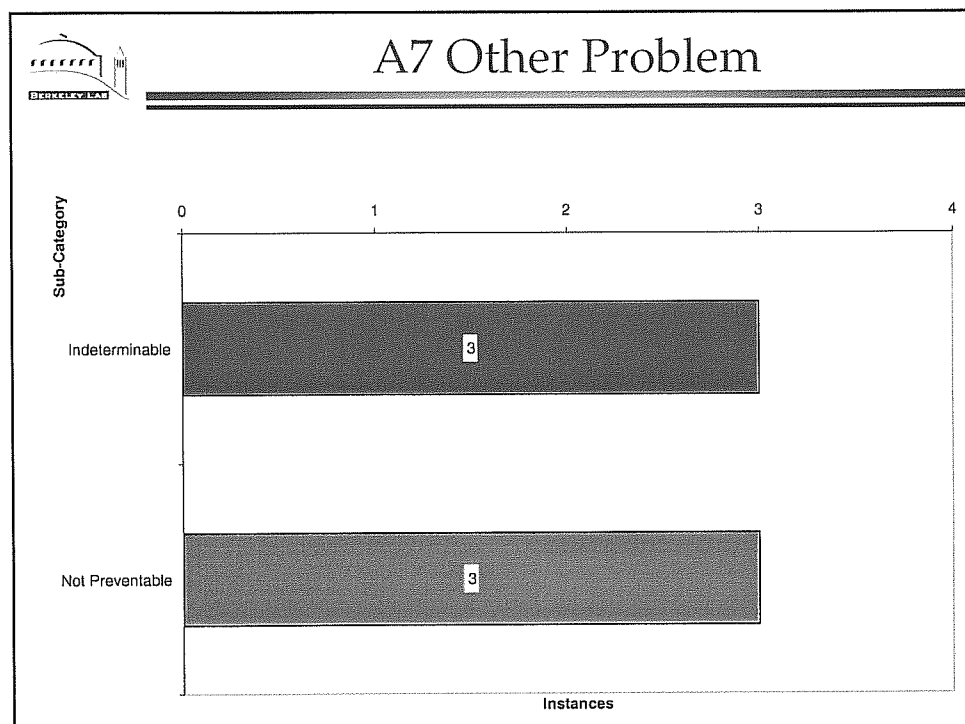
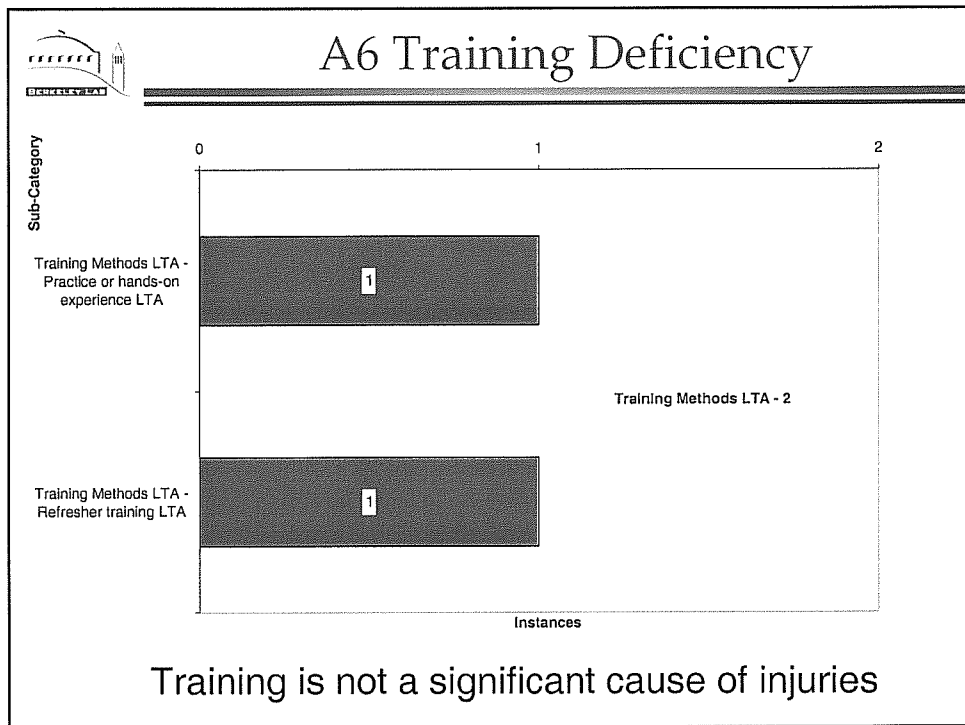
- Select a root cause investigation methodology for LBNL.
- Require root cause determination for all incidents by coordinators and liaisons.
- Review all root cause determinations for adequacy soon after the determination is made, when changes are still possible.
- Require that corrective actions address root causes.



Backup Slides







No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
19	Auto accident	Employee was driving a Lab vehicle in the 4th lane on southbound 380. He was going to a job site in Fremont to collect data from a monitoring instrument. At a location approximately 1 mile north of the Mount Diablo, his vehicle was struck by another vehicle. He suffered minor cuts and abrasions and broke two ribs on the left side.	A7 Not Preventable			Not struck by other car on freeway, not preventable by LBNL
25	Auto accident	Employee was turning left a bus and ran out from between parked cars into the path of an oncoming vehicle, which ran over her foot. She suffered broken bones.	A1B3C02	A2B1C02		Poorly designed traffic layout and employee did not stop to look for traffic before stepping into traffic lane
34	Debris in eye	Employee was grinding at the Molecular foundry, using safety glasses and face shield. On the way home, he noticed that something was irritating his eye, and he went to Kaiser for treatment.	A7 Indeterminate			Insufficient data to make a reliable root cause determination
29	Driving/Ergo	Employee states "pain in the left shoulder, arm and hand, thumb and index finger was manifested for the first time. Could not drive later in the day."	A4B3C10			Route involves repetitive turning & neck turning
9	Dropped objects	Employee was signing a hinge pin during steel erection, when the pin suddenly flew up and dropped into place, pinching the employee's finger in the process.	A2B4C01			Employee handed pin in a manner which did not preclude injury when the pin fell into place as it was supposed to
23	Dropped objects	Employee and co-worker were working on guardrails near building 8. While lifting a section, another section fell on employee's steel toe safety boots, puncturing through the rubber and causing a laceration that required 4 sutures.	A2B4C02			Inappropriate stacking by others a few days earlier
27	Dropped objects	Employee was transferring lead bricks wrapped in vinyl tape from a lift table to a shelf. A lower brick adhered to the brick he was moving sufficiently to be dislodged from the table and it fell from a height of approximately 50" on to his right foot. Employee was wearing steel-toed foot protection and leather gloves. The impact on his foot occurred above the toe box and resulted in a metatarsal fracture.	A2B4C01			Supervisor identified that cart should have been closer to shelf
41	Glassware cut	Employee was washing a small (100-150 ml) beaker with a scrub sponge using his right thumb and first and second fingers to reach down inside the beaker. Was cut on the right 4th digit on the distal side by a broken edge on the lip of the beaker.	A2B3C01			Employee did not notice defect in glassware until he had cut himself. Glassware was inherited from other lab
3	Hot water/steam	Employee was removing a pan of hot water from a steam table and suffered a burn to the back of the right hand when some of the water splashed.	A4B3C02			Management routinely required workers to lift and move open trays with scalding hot water

No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
22	Hot water/steam	Employee was performing routine maintenance on a steam cleaner. Half an hour into the procedure, a fitting failed, causing the cleaning wand to fly backwards, burning the employee's right side with steam. Preliminary information indicates that the nozzle was partially corroded and plugged, causing an excessive pressure build-up which led to the failure of the fitting.	A5B1C04	A4B3C02	A2B3C03	Employee attempted to repair a hazardous, defective piece of equipment he was not familiar with. Management had not provided competent replacement for senior employees who were familiar with the equipment that had retired or been laid off.
1	Lifting	Employee was attempting to move a compressed gas cylinder by pulling up on the protective cap. The cap came loose and struck him in the mouth, cracking a tooth, which required a root canal and gum surgery.	A3B3C00	A0B2C01		Both employee and supervisor were unaware that cylinders may not be moved by lifting or pulling on the cylinder cap.
2	Lifting	Employee was placing a spin coater back into a laminar flow hood and felt pain in his lower back on 10/20/04. Spin coaters are estimated to weigh 40 lbs. and is 2'x2'x2'. He lifted the spin coater up ~35" from the floor into the flow hood and placed it through the holes in the flow hood to its resting position.	A3B1C04	A1B1C03		Enclosure should have been designed with removable panel, to allow unit to be slid in and out, rather than requiring lifting.
5	Lifting	Two employees were moving tables from a conference room to the outer hall area as per a client's request. The table (72" long x 42" wide) was lifted in the open, up right position and carried out through a set of double doors. When the table was set back down on the floor, the support legs on one side collapsed and the table fell on the employee's left foot, bruising the great toe. Employee was not wearing safety shoes.	A3B4C02	A2B2C02		Facilities purchased poor quality tables, had no mechanism for inspecting tables placed into conference rooms.
4	Lifting	Employee suffered a trauma from performing routine carpenter work over a period of time. Could not recall a specific instance, but the pain had gotten worse and the surgery was done on an emergency basis.	A2B4C01	A4B4C02		Mazelet handling technique inadequate plus matrix supervisor was aware of discomfort and did not intervene.
12	Lifting	Employee suffered a bilateral upper arm and shoulder sprain while lifting heavy files in and out of a file cabinet. This involved reaching beyond her normal range of motion and lifting file folders weighing up to 7.5 pounds with a thickness of 4 inches on a repetitive/daily basis.	A3B1C00	A0B1C01		Employee exceeded her physical capabilities, and management did not notice the problem until injury had occurred.
21	Lifting	Preliminary report based on the Doctor's report from Kaiser Oakland which states that the employee injured his low back while lifting a heavy centrifuge rotor. Was treated at Kaiser Oakland and given prescription medication.	A2B4C01	A2B2C02		Employee was standing too far from rotor to safely lift it and employee was rushing.
27	Lifting	Employee was lifting a crate with co-worker from a table 3' tall to the scale 6' off the floor. Lifted it and placed it on the scale and then lifted it back onto the table. Felt no pain that day and then on Saturday and Sunday fell out and went to Kaiser Vallejo for treatment.	A3B1C02			Lifting equipment was available, employees chose manual lifting.
23	Lifting	Employee injured her right shoulder on 5/25/05 while moving the floor and emptying the trash (200-10-30F4). She was seen by her own PMD on 5/30/05 and brought the medical information to Health Services on 5/4/05.	A4B1C00	A2B3C00		Employee did not understand that previously communicated instructions to dump mop water into floor drain applied to her.

No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
26	Lifting	The employee was lifting a compressor out of a cardboard box. The compressor was wedged in styrofoam packing material so the employee used a twisting motion to free and lift the equipment from the box. The employee fell lower back pain on his right side after lifting the compressor.	A2B4C01			Unable to determine whether employee's choice of method was reasonable or not. Weight was or without box was reasonable.
11	Moving and/or objects	Employee stepped on a door sill while carrying a 25 lbs power supply, and the outer metatarsal bone in his left foot cracked. Employee was wearing new safety shoes. He had previous fractures to the foot from a motorcycle accident 10 years earlier.	A7 Not Preventable			Personal medical problem: aggravation of pre-existing medical condition.
17	Moving and/or objects	Employee and coworker were sliding a 200+ lbs acrylic plate (18x32" thick) on its edge across the bathroom floor to store it next to the custodian's sink. As they tried to make the turn between the hand washing station and the urinal, the plate slipped and fell on the employee's left foot. Safety shoes prevented a more serious injury, but the plate bruised the employee's metatarsal area. Employee now requires physical therapy.	A2B4C02	A4B1C04		Management failed to provide adequate storage facilities in B-09.
24	Moving and/or objects	The employee stated he was descending down the stairway near building 71 with a recycle bin full of paper. When he lost control of the bin, he grabbed the banister with his right hand and tried to stop it from falling down the stairs when he slammed his right index, middle, and ring fingers. The employee stated the bin could weigh between 150 and 200 pounds.	A3B1C09	A4B4C11		Employee's feet pressure to complete work rapidly regardless of safety instructions to the contrary.
25	Moving and/or objects	The employee stated she was trying to stop a door from closing when she jammed her right thumb on the door.	A3B1C09			There is no defect in the door or the door mechanism that contributed to this incident.
28	Moving and/or objects	Employee walked into a protruding piece of 4x4 angle iron, breaking the 5th metatarsal bone in his right foot.	A2B4C02			Material was stored in an inappropriate manner. Insufficient information to determine why and how.
39	Power tool	Plumber was operating a 1/2" drill motor with a 4" diam. hole saw. He was using the tool to drill through a sheet metal stud when it bounced up and twisted out of his grasp, resulting in a fracture to the 4th metacarpal bone of his right hand.	A3B4C02	A4B1C01	A4B4C01	Employee was using a tool from which the required safety handle had been removed in the presence of a supervisor who did not object to this unsafe practice.
40	Power tool	Employee states that he was using a 1/2" drill motor with a 2" hole saw. While drilling sheetrock, the drill motor hit some backing in the wall that caused the motor to twist and it twisted his left hand.	A7 Indeterminate			Insufficient data to make a reliable root cause determination.
4	Repetitive keyboard	Employee was under intense pressure to create a report. She had just gotten a new laptop, and did not have an external mouse or docking station for a yet. She used it all day in meetings on Friday. On Saturday she woke up and her right hand/wrist were swollen, painful, and unstable.	A4B3C02	A2B9C05		Assigned to work on new laptop all day w/ poor ergonomics, employee tried to work through pain.
7	Repetitive keyboard	While inputting information from hardcopy documents into an intranet computer database system, employee solely used her left thumb and index finger to turn the individual sheets of paper over. This motion eventually caused the thumb tendon to catch/click upon flexing the digit.	A3B3C09			Employee did not recognize that she was using her thumb in an ergonomically inappropriate manner.

No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
9	Repetitive keyboard	Employee started feeling discomfort on his right shoulder and forearm in late October 2004. He tried a new mouse on his own. On December 1st an ergo evaluation was performed at employee's request and adjustments were made to his workstation. The pain in the shoulder was resolved, and the arm was reportedly getting better. Over the Holiday break the pain got much better, but returned strongly after one day back at work.	A3B3C09	A4B5C04	A0B3C03	Changed to mouse intensive software, tried to work through the pain rather than seeking early intervention, had only CD-ROM training 3.5 years earlier.
15	Repetitive keyboard	Employee experienced pain to her left side (chest, arm and hand) when driving the van (3/27/05) and also Bus #2 on (3/11/05). Pain is now going down her left arm from her neck. Referred to go to US HealthWorks for treatment and assessment.	A1B5C01	A2B4C01		Employee suffers from multiple symptoms, some of which are related to her driving of LBNL.
18	Repetitive keyboard	Employee complained of a resurgence of shoulder pain that had been ongoing for several weeks. He went to Health Services early in February, had an ergonomic evaluation, and made several changes. After an initial improvement, he had a resurgence of pain, and a 2-week course of PT.	A1B5C01			Limited information since ergo assessment was done on campus.
20	Repetitive keyboard	Employee was complaining of both wrists hurting due to computer work. An ergonomic evaluation for his workstation was performed on 3/2/05 and performed on 3/29, but the recommended keyboard tray has not yet arrived. Employee also uses a laptop at home. At the end of April the pain continued and employee is now being treated with prescription medication and physical therapy.	A1B5C01	A4B1C04		Inadequate monitoring of ergonomic problems by management.
22	Repetitive keyboard	Employee suffers pain and swelling in her right wrist. The key board tray was tilted at about a 90 to 45 degree angle so as to cause an upward extension of both hands when using the keyboard tray, and the employee thought the adjustable keyboard tray was broken. The employee was using her right hand to use the computer mouse.	A1B5C01	A4B1C04	A2B9C05	Neither employee nor supervisor knew proper ergonomic position of keyboard tray, now how the controls on the tray could be adjusted.
30	Repetitive keyboard	Employee suffers from wrist and shoulder pain as a result of working on an ergonomically incorrectly adjusted work station.	A1B5C01	A4B5C10		Employee with known ergonomic issues worked at an incomplete workstation. Management did not assure workstation was ready when employee's assignment was changed.
31	Repetitive keyboard	Over past several months increasing computer work due to a number DOE and other reviews of the Division increased her computer work. Developed increased discomfort in forearms and rest of upper extremity.	A3B1C09	A4B1C02	A2B4C05	When workload increased employee did not alert supervisor to ergonomic discomfort until physical therapy was needed.
35	Repetitive keyboard	The employee is complaining of bilateral wrists, forearms, and shoulder pain after repetitive use of computer making plates. She also uses a computer keyboard and mouse. She has pain/tenderness in both wrists and forearms.	A1B5C01	A4B9C02		Poorly arranged work space with all of the knee holes under workbenches used for storage, making it impossible to work safely.
38	Repetitive keyboard	The employee stated she has pain in her right wrist with numbness in her right index finger and right thumb after using her computer keyboard and mouse.	A3B3C09	A4B5C04		Employee work habits not in line with good ergonomic practice, heavy added travel work prior to

No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
40	Repetitive strain	Repetitive strain to multiple body parts. Employee is currently working in Bldg 51 R doing procedures on the computer prior to running the experiment. Has been in this location about 2 weeks. Prior to that he was in Bldg 9C where an ergonomic evaluation was completed and various keyboard, pointing devices were installed to eliminate right wrist pain.	A4B3C02	A4B3C04		Employee with prior ergonomic issues decided to work on personal laptop computer in the lab even though an ergonomically correct workstation had been provided to him in an office.
42	Repetitive strain	The employee is complaining of right forearm, elbow, upper arm, and shoulder pain after using her computer keyboard and mouse. She is right hand dominant. She has joint tenderness on her right elbow and upper arm.	A4B1C08	A4B3C03		Recommendations from previous ergo evaluation has not been implemented, i.e., assistant had been hired as recommended, but had not been trained/authorized to assume any of the computer tasks.
43	Repetitive strain	Employee is suffering from wrist pain due to computer use. Had an ergonomic evaluation in April. Started feeling better, now it's worse.	A1B3C01	A4B4C02	A2B9C06	Employee's ergonomic concerns were not addressed in a timely manner.
46	Repetitive strain	The employee is complaining of right hand pain after using his computer keyboard and mouse. This started about a month ago. He is right hand dominant. A small amount of swelling was noticed on the back of his right hand near the index and middle fingers. He has noticed limited movement in his right hand. He works 2 days/week in building 52A, and 3 days/week in building 905 in Livermore. He also works one day/week at home. The employee was referred to U2 Healthworks for treatment, and an evaluation of his right hand.	A1B3C01	A5B4C00		Employee failed to report pain as a result of computer work to his supervisor until a required physical therapy.
50	Repetitive strain	Employee states that he believes the right hand pain started months ago (5/11/05). He had an ergonomic evaluation about 4 months ago and all the items requested have been ordered and installed. Employee states that the right hand pain has improved but noticed pain this AM when working at the computer keyboard.	A1B3C01	A5B4C00	A4B9C02	Employee failed to report pain as a result of computer work to his supervisor until a required physical therapy.
10	Slip/fall	The employee slipped on stairs in building 50 A when she fell hitting both knees, right wrist and shoulder. She fell down seven stairs and landed at the bottom of the stairway.	A3B1C09	A2B9C02		Stair variance not discovered during construction 55 years earlier, no history of falls on this stair case, hence also possible employee missed.
13	Slip/fall	Employee was descending down the stairs in building C when she fell, landing on her hands and knees. Employee was carrying a shoulder bag weighing 3 lbs. cutned nothing in her hands.	A3B1C02			No stair defect.
16	Slip/fall	Employee slipped on a wet spot on the floor in the hallway of Bldg 7A, resulting in hematoma to head upon impact with the door frame and contusions to elbows and knees upon impact with the linoleum floor surface. Water most likely was spilled by someone who had used a nearby water faucet.	A7 Indeterminable			Insufficient data to make a reliable root cause determination.
41	Slip/fall	While walking on top of a pile of unbundled studs with some debris, the pile shifted, employee fell and his right hand landed on a 5/16" hex screw causing a puncture wound.	A3B4C02	A4B1C01		Management assigned task to random individuals without specifying expectations.

No.	Type	Description	Root Cause 1	Root Cause 2	Root Cause 3	Justification for Root Causes
45	Slip/fall	According to the Employer's Report of injury, Mr. Mallet was in the back of a truck that was loaded with scrap metal when he stepped on uneven scrap causing a twisting of the right ankle.	A3B1C09			Employee was precariously in back of truck loading materials into racks.
47	Slip/fall	Employee called this AM to report an injury which occurred on 8/24/05 at 4:00PM while at work. He attended a class at Bldg 51 Room 201 (Electrical Hazard) and walked back down to his office in Lathimer Hall D 14. He twisted his left ankle near the Creek Theater and believes it was due to an uneven surface. He went to Kaiser Valley where his left ankle was x-rayed then called that.	A7 Not Preventable			Employee twisted his foot while walking on an uneven surface on the campus, not under LBNL control.
48	Slip/fall	Electrician was climbing down on a 10 foot tall A-frame fiberglass (owned by Sisco) ladder when the ladder kicked to the side and Mr. Seier fell between the ladder and the concrete wall. When he hit the ground, he fell backward, his head came off, and he struck his head against a grounding bar mounted against the wall, lacerating his scalp.	A5B3C09			Employee selected the wrong ladder for the job.
14	Tape dispenser cut	The employee works in the Facilities Stores Department and was using a box with tape. While holding the box flaps closed with his right hand, the employee reached for tape with his left hand. The small finger on his left hand brushed the cutting edge of the tape dispenser causing a laceration.	A4B1C04	A1B4C04	A2B9C06	Tool improperly installed, unsafe tool not discovered during safety inspections, hazard accepted during years of use.

